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# **SYNTHETIC ESTIMATES of Adult LITERACY PROFICIENCIES for REGIONS of IOWA**

**IOWA DEPARTMENT of Education**

**JUNE 1995**



State of Iowa  
**Department of Education**

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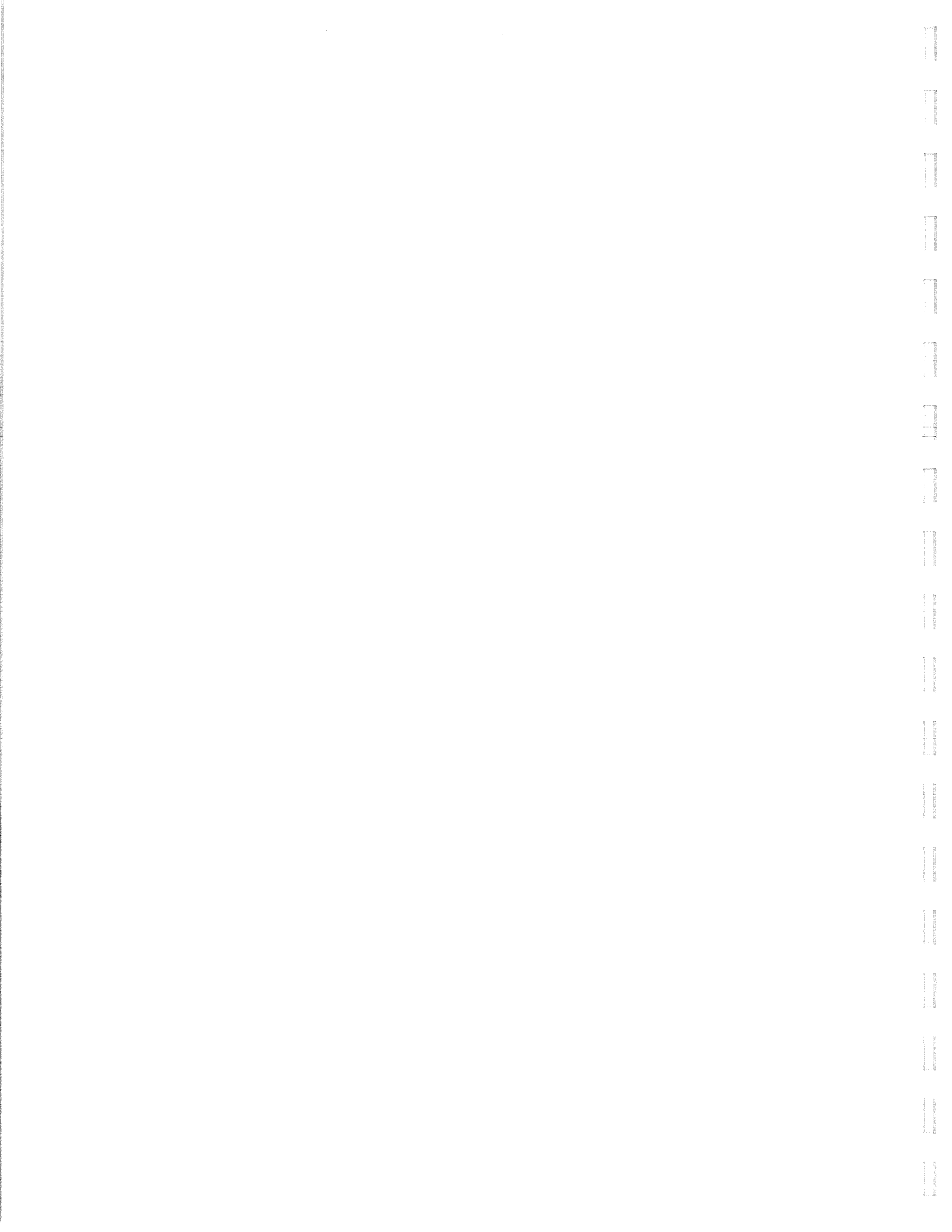
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# **Synthetic Estimates of Adult Literacy Proficiencies for Regions of Iowa**

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## **Purpose**

The purpose of this report is to provide service providers and funding agencies with information about the distribution of adult literacy proficiencies over various regions of the state of Iowa. These estimates can provide information about the relative degree of need for adult literacy services in different regional areas and assist with prioritizing and targeting limited resources for service provision. These estimates are commensurate with those provided on a statewide basis by the recent Iowa State Adult Literacy Survey (Jenkins & Kirsch, 1994), but provide information at the regional level of the state. The estimates are parallel to ones adopted by the National Education Goals Panel as indicators of state progress towards meeting the national goal in adult literacy and lifelong learning (National Education Goals Panel, 1993).

## **Method**

Adult literacy proficiency distributions are estimated for each of the 17 PUMAs (Public Use Microdata Areas) in the state of Iowa in the 1990 Census. Proficiencies are estimated on the 0-500 point scales utilized in the recent National Adult Literacy Survey (NALS). Separate estimates are made for three literacy scales reported by NALS: Prose, document and quantitative literacy, as well as for a combined literacy proficiency scale calculated as the average of the three original scales. Further information about the NALS assessment survey, its results and the interpretation of its scores are described in Kirsch et al (1993).

The estimation methods used are the same as those described in the earlier report, *Synthetic Estimates of NALS Literacy Proficiencies from 1990 Census Microdata* (Reder, 1994). Whereas the earlier report used these methods to predict literacy proficiency at the state level, the current study predicts literacy proficiencies at the PUMA level for the state of Iowa. The predictive model, applied to each 5% sample Census long-form, predicts individuals' (age 16 and above) literacy proficiencies from their background characteristics. These predictions are made with multiple regression models developed from analysis of the relationships between background characteristics and assessed literacy proficiencies among NALS survey participants. The individual background variables used in these predictive equations are those which are common to both the NALS background questionnaire and the 1990 Census long form. Details of the models, the variables involved, and the validity of their predictions are given in the earlier report (Reder, 1994).

The synthetic statewide estimates for Iowa are shown in Table 1 along with the corresponding results from the Iowa State Adult Literacy Survey (the “SALS Estimates” in the table). These summary data indicate that the synthetic estimates are quite accurate for the overall proficiency and for the percentage of the adult population at Level 2. Synthetic estimates for Level 1 are somewhat lower and those for the combined Levels 3-5 are somewhat higher than their counterparts estimated by the survey. The tendency of the model to underestimate the percentage of adults at Level 1 should be kept in mind in working with the estimates for Iowa’s PUMAs.

**Table 1**  
**Synthetic and SALS Estimates for Iowa**

		Synthetic Estimate	SALS Estimate
Combined	Mean:	284	284
	Level 1	185,011 ( 9%)	292,616 (14%)
	Level 2	468,447 (23%)	515,460 (25%)
	Levels 3-5	1,370,851 (68%)	1,287,336 (61%)
Prose	Mean:	286	285
	Level 1	167,863 ( 8%)	311,903 (15%)
	Level 2	453,961 (22%)	487,891 (22%)
	Levels 3-5	1,402,485 (69%)	1,295,618 (62%)
Document	Mean:	280	280
	Level 1	214,334 (11%)	332,772 (16%)
	Level 2	519,266 (26%)	536,009 (26%)
	Levels 3-5	1,290,709 (64%)	1,226,631 (59%)
Quantitative	Mean:	287	287
	Level 1	176,838 ( 9%)	299,448 (14%)
	Level 2	427,145 (21%)	443,676 (21%)
	Levels 3-5	1,420,326 (70%)	1,352,288 (65%)
Population		2,024,309	2,095,412

Notes: Percentages may not sum to 100% due to rounding. SALS estimates based on unofficial corrections for undercount in the 1990 US Census, whereas synthetic estimates are based on official 1990 Census counts.



## Results

Results of applying these techniques to Iowa's 17 PUMAs are presented in the figure and tables accompanying this report. The map in Figure 1 displays the geographical boundaries of the PUMAs in Iowa (Census of Population and Housing, 1991). Most PUMAs correspond to clusters of contiguous counties, as shown in the map. The urban area of Des Moines, on the other hand, is subdivided into multiple PUMAs, as shown in the map.

Results are presented for each PUMA in the appended tables. The Population shown in each table is the 1990 Census count of individuals age 16 and older not living in group quarters. Each table provides estimates of each of the literacy proficiencies (prose, document, quantitative, combined): the mean proficiency and the percentages of adults at three proficiency levels (Level 1: under 225; Level 2, 226-275; Levels 3-5, 276 and above). These are standard proficiency reporting levels from the NALS; adults performing at Levels 1 and 2 are generally taken as those most in need of improved literacy. Prose, document and quantitative literacy were defined by NALS as follows:

*Prose literacy*: "the knowledge and skills needed to understand and use information from texts that include editorials, news stories, poems, and fiction" (Kirsch et al, 1993: 3)

*Document literacy*: "the knowledge and skills required to locate and use information contained in materials that include job applications, payroll forms, transportation schedules, maps, tables, and graphs" (Kirsch et al, 1993: 3)

*Quantitative literacy*: "the knowledge and skills required to apply arithmetic operations, either alone or sequentially, using numbers embedded in printed materials" Kirsch et al, 1993: 3-4).

## Generating Estimates for Clusters of PUMAs

The PUMA-level estimates in the appended tables can readily be aggregated to produce corresponding estimates for clusters of two or more PUMAs. To aggregate data in this way across PUMAs, it is important to use the tabulated population sizes as weights. To calculate a mean literacy proficiency for an aggregate of two PUMAs, for example, compute the weighted average of the two PUMAs' corresponding mean proficiencies, using the listed populations as weighting factors. As another example, to calculate the percentage of Level 1 proficiencies for the two-PUMA aggregate, multiply each PUMA's Level 1 percentage by its corresponding population size, giving the number of individuals estimated at Level 1 in the given PUMA. By adding these cross-products together and dividing their sum by the total number in the two-PUMA aggregate (i.e., by the sum of the two population counts), the aggregate percentage at Level 1 in the two PUMAs together can be estimated.

## Discussion

Despite the small degree of measurement error present, especially for Level 1 percentages (further discussed by Reder, 1994), the PUMA-level literacy estimates should be quite useful for their

present purpose, contrasting the overall literacy needs of the adult populations in various regions of Iowa. Considerable variation is evident among the overall literacy proficiencies of these regions. If we examine, for example, the percentage of the adult population having a combined literacy proficiency at Level 3 or above (taken by the National Educational Goals Panel as an indicator of the percentage of adults with adequate literacy skills and knowledge), we find a range of 62 - 84 % across the various PUMAs. This corresponds to a varying level of need for improved literacy (Level 1 + Level 2) of 16 - 38% of the adult population across the 17 PUMAs. The lowest level of need (using the Level 1 + Level 2 criterion) occurs in Des Moines (PUMA 800), whereas the highest level occurs in the southern counties (PUMA 1600). The mean combined literacy proficiency ranges from 280 to 303 across Iowa's PUMAs, with the highest value in outlying Polk County (PUMA 800) and the lowest in the southern counties (PUMA 300).

## References

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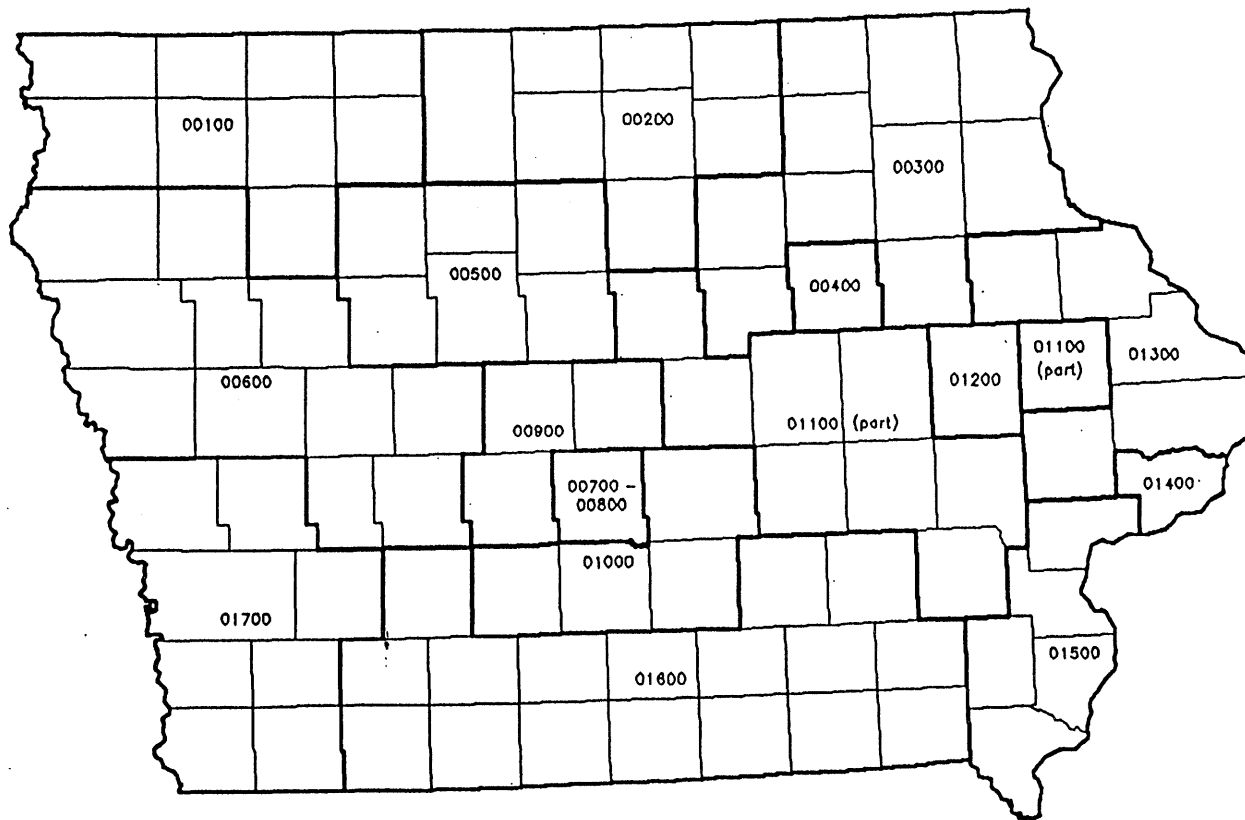
# **Appendix A**

**Map of Iowa**

**PUMA BOUNDARIES**

# IOWA

## 5% PUMA BOUNDARIES



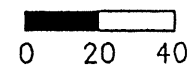
### IOWA 5% PUMA Boundaries

- ☐ Counties
- ☐ PUMAs
- ☐ States

### PUMAs In Selected Areas:

00700 Des Moines city  
00800 Balance of Polk County

Miles





# **Appendix B**

## **Listing of Synthetic Literacy Estimates for PUMAs 100-1700**

**Synthetic Literacy Estimates for  
PUMA 100  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	283
	Percent in Level 1	11
	Percent in Level 2	20
	Percent in Levels 3-5	68
Prose	Mean Proficiency:	286
	Percent in Level 1	10
	Percent in Level 2	19
	Percent in Levels 3-5	71
Document	Mean Proficiency:	278
	Percent in Level 1	13
	Percent in Level 2	23
	Percent in Levels 3-5	64
Quantitative	Mean Proficiency:	286
	Percent in Level 1	11
	Percent in Level 2	18
	Percent in Levels 3-5	71
Population	100617	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Buena Vista  
Clay County  
Dickinson  
Emmet  
Lyon  
O'Brien  
Osceola  
Palo Alto  
Sioux

# **Synthetic Literacy Estimates for PUMA 200**

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	285
	Percent in Level 1	10
	Percent in Level 2	23
	Percent in Levels 3-5	67
Prose	Mean Proficiency:	288
	Percent in Level 1	9
	Percent in Level 2	21
	Percent in Levels 3-5	71
Document	Mean Proficiency:	279
	Percent in Level 1	11
	Percent in Level 2	25
	Percent in Levels 3-5	63
Quantitative	Mean Proficiency:	287
	Percent in Level 1	9
	Percent in Level 2	21
	Percent in Levels 3-5	70
Population		102250

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Cerro Gordo  
 Floyd  
 Franklin  
 Hancock  
 Kossuth  
 Mitchell  
 Winnebago  
 Worth

**Synthetic Literacy Estimates for  
PUMA 300  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	281
	Percent in Level 1	12
	Percent in Level 2	21
	Percent in Levels 3-5	67
Prose	Mean Proficiency:	284
	Percent in Level 1	11
	Percent in Level 2	20
	Percent in Levels 3-5	69
Document	Mean Proficiency:	276
	Percent in Level 1	14
	Percent in Level 2	24
	Percent in Levels 3-5	63
Quantitative	Mean Proficiency:	283
	Percent in Level 1	12
	Percent in Level 2	20
	Percent in Levels 3-5	68
Population	122491	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

•  
Bremer  
Allamakee  
Buchanan  
Butler  
Chickasaw  
Clayton  
Fayette  
Grundy  
Howard  
Winneshiek



**Synthetic Literacy Estimates for  
PUMA 400  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	286
	Percent in Level 1	9
	Percent in Level 2	24
	Percent in Levels 3-5	67
Prose	Mean Proficiency:	289
	Percent in Level 1	7
	Percent in Level 2	23
	Percent in Levels 3-5	70
Document	Mean Proficiency:	281
	Percent in Level 1	10
	Percent in Level 2	26
	Percent in Levels 3-5	63
Quantitative	Mean Proficiency:	287
	Percent in Level 1	9
	Percent in Level 2	22
	Percent in Levels 3-5	69
Population	90043	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following county:

Black Hawk

**Synthetic Literacy Estimates for  
PUMA 500  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	284
	Percent in Level 1	9
	Percent in Level 2	26
	Percent in Levels 3-5	65
Prose	Mean Proficiency:	287
	Percent in Level 1	8
	Percent in Level 2	23
	Percent in Levels 3-5	69
Document	Mean Proficiency:	278
	Percent in Level 1	11
	Percent in Level 2	29
	Percent in Levels 3-5	61
Quantitative	Mean Proficiency:	286
	Percent in Level 1	8
	Percent in Level 2	23
	Percent in Levels 3-5	68
Population	74882	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Calhoun  
Hamilton  
Humboldt  
Pocahontas  
Webster  
Wright

**Synthetic Literacy Estimates for  
PUMA 600  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	282
	Percent in Level 1	11
	Percent in Level 2	24
	Percent in Levels 3-5	65
Prose	Mean Proficiency:	285
	Percent in Level 1	9
	Percent in Level 2	23
	Percent in Levels 3-5	68
Document	Mean Proficiency:	277
	Percent in Level 1	12
	Percent in Level 2	27
	Percent in Levels 3-5	61
Quantitative	Mean Proficiency:	284
	Percent in Level 1	10
	Percent in Level 2	22
	Percent in Levels 3-5	67
Population	170777	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Woodbury  
Audubon  
Carroll  
Cherokee  
Crawford  
Greene  
Guthrie  
Ida  
Monona  
Plymouth  
Sac

**Synthetic Literacy Estimates for  
PUMA 700  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	286
	Percent in Level 1	8
	Percent in Level 2	26
	Percent in Levels 3-5	66
Prose	Mean Proficiency:	288
	Percent in Level 1	7
	Percent in Level 2	25
	Percent in Levels 3-5	68
Document	Mean Proficiency:	281
	Percent in Level 1	10
	Percent in Level 2	28
	Percent in Levels 3-5	62
Quantitative	Mean Proficiency:	287
	Percent in Level 1	8
	Percent in Level 2	24
	Percent in Levels 3-5	67
Population	141249	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following city:

Des Moines

**Synthetic Literacy Estimates for  
PUMA 800  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	303
	Percent in Level 1	3
	Percent in Level 2	13
	Percent in Levels 3-5	84
Prose	Mean Proficiency:	306
	Percent in Level 1	3
	Percent in Level 2	12
	Percent in Levels 3-5	86
Document	Mean Proficiency:	299
	Percent in Level 1	4
	Percent in Level 2	15
	Percent in Levels 3-5	81
Quantitative	Mean Proficiency:	306
	Percent in Level 1	3
	Percent in Level 2	11
	Percent in Levels 3-5	86
Population	99427	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following cities and county:

Alleman  
 Altoona  
 Ankeny  
 Bondurant  
 Carlisle  
 Clive  
 Elkhart  
 Grimes  
 Johnston  
 Mitchellville  
 Pleasant Hill  
 Polk City  
 Polk County (part)  
 Runnells  
 Saylorville CDP  
 Sheldahl  
 Urbandale  
 West Des Moines  
 Windsor Heights

**Synthetic Literacy Estimates for  
PUMA 900  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	297
	Percent in Level 1	4
	Percent in Level 2	18
	Percent in Levels 3-5	78
Prose	Mean Proficiency:	300
	Percent in Level 1	4
	Percent in Level 2	16
	Percent in Levels 3-5	80
Document	Mean Proficiency:	293
	Percent in Level 1	6
	Percent in Level 2	20
	Percent in Levels 3-5	75
Quantitative	Mean Proficiency:	300
	Percent in Level 1	4
	Percent in Level 2	16
	Percent in Levels 3-5	80
Population	90448	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Dallas  
Boone  
Story

**Synthetic Literacy Estimates for  
PUMA 1000  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	287
	Percent in Level 1	8
	Percent in Level 2	21
	Percent in Levels 3-5	71
Prose	Mean Proficiency:	289
	Percent in Level 1	7
	Percent in Level 2	20
	Percent in Levels 3-5	73
Document	Mean Proficiency:	282
	Percent in Level 1	10
	Percent in Level 2	23
	Percent in Levels 3-5	67
Quantitative	Mean Proficiency:	289
	Percent in Level 1	8
	Percent in Level 2	19
	Percent in Levels 3-5	73
Population	80277	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Warren  
Jasper  
Madison  
Marion

**Synthetic Literacy Estimates for  
PUMA 1100  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	293
	Percent in Level 1	7
	Percent in Level 2	19
	Percent in Levels 3-5	74
Prose	Mean Proficiency:	295
	Percent in Level 1	6
	Percent in Level 2	18
	Percent in Levels 3-5	76
Document	Mean Proficiency:	288
	Percent in Level 1	8
	Percent in Level 2	21
	Percent in Levels 3-5	70
Quantitative	Mean Proficiency:	295
	Percent in Level 1	7
	Percent in Level 2	17
	Percent in Levels 3-5	76
Population	193000	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Johnson  
Benton  
Hardin  
Iowa  
Jones  
Marshall  
Poweshiek  
Tama  
Washington



**Synthetic Literacy Estimates for  
PUMA 1200  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	294
	Percent in Level 1	5
	Percent in Level 2	19
	Percent in Levels 3-5	76
Prose	Mean Proficiency:	296
	Percent in Level 1	4
	Percent in Level 2	18
	Percent in Levels 3-5	78
Document	Mean Proficiency:	289
	Percent in Level 1	7
	Percent in Level 2	21
	Percent in Levels 3-5	73
Quantitative	Mean Proficiency:	296
	Percent in Level 1	5
	Percent in Level 2	18
	Percent in Levels 3-5	77
Population	127040	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following county:

Linn

**Synthetic Literacy Estimates for  
PUMA 1300  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	285
	Percent in Level 1	9
	Percent in Level 2	21
	Percent in Levels 3-5	70
Prose	Mean Proficiency:	288
	Percent in Level 1	8
	Percent in Level 2	21
	Percent in Levels 3-5	71
Document	Mean Proficiency:	281
	Percent in Level 1	11
	Percent in Level 2	23
	Percent in Levels 3-5	66
Quantitative	Mean Proficiency:	288
	Percent in Level 1	9
	Percent in Level 2	20
	Percent in Levels 3-5	71
Population	136511	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Dubuque  
Cedar  
Clinton  
Delaware  
Jackson

**Synthetic Literacy Estimates for  
PUMA 1400  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	290
	Percent in Level 1	8
	Percent in Level 2	22
	Percent in Levels 3-5	71
Prose	Mean Proficiency:	293
	Percent in Level 1	6
	Percent in Level 2	21
	Percent in Levels 3-5	73
Document	Mean Proficiency:	286
	Percent in Level 1	9
	Percent in Level 2	23
	Percent in Levels 3-5	68
Quantitative	Mean Proficiency:	292
	Percent in Level 1	8
	Percent in Level 2	20
	Percent in Levels 3-5	72
Population	110745	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following county:

Scott

**Synthetic Literacy Estimates for  
PUMA 1500  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	283
	Percent in Level 1	10
	Percent in Level 2	24
	Percent in Levels 3-5	66
Prose	Mean Proficiency:	286
	Percent in Level 1	8
	Percent in Level 2	23
	Percent in Levels 3-5	69
Document	Mean Proficiency:	278
	Percent in Level 1	11
	Percent in Level 2	26
	Percent in Levels 3-5	63
Quantitative	Mean Proficiency:	285
	Percent in Level 1	10
	Percent in Level 2	22
	Percent in Levels 3-5	68
Population	112281	

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Des Moines  
Henry  
Lee  
Louisa  
Muscatine

# **Synthetic Literacy Estimates for PUMA 1600**

Individuals Age 16 and Above

	Synthetic Estimate	
Combined	Mean Proficiency:	280
	Percent in Level 1	10
	Percent in Level 2	28
	Percent in Levels 3-5	62
Prose	Mean Proficiency:	283
	Percent in Level 1	9
	Percent in Level 2	26
	Percent in Levels 3-5	65
Document	Mean Proficiency:	275
	Percent in Level 1	12
	Percent in Level 2	29
	Percent in Levels 3-5	58
Quantitative	Mean Proficiency:	283
	Percent in Level 1	10
	Percent in Level 2	26
	Percent in Levels 3-5	65
Population		144096

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Adair  
Adams  
Appanoose  
Clarke  
Davis  
Decatur  
Jefferson  
Keokuk  
Lucas  
Mahaska  
Monroe  
Ringgold  
Taylor  
Union  
Van Buren  
Wapello  
Wayne

**Synthetic Literacy Estimates for  
PUMA 1700  
Individuals Age 16 and Above**

	Synthetic Estimate	
Combined	Mean Proficiency:	283
	Percent in Level 1	9
	Percent in Level 2	26
	Percent in Levels 3-5	66
Prose	Mean Proficiency:	286
	Percent in Level 1	8
	Percent in Level 2	24
	Percent in Levels 3-5	69
Document	Mean Proficiency:	278
	Percent in Level 1	11
	Percent in Level 2	28
	Percent in Levels 3-5	62
Quantitative	Mean Proficiency:	285
	Percent in Level 1	9
	Percent in Level 2	23
	Percent in Levels 3-5	68
Population		128220

Note: Percentages may not sum to 100 due to rounding.

PUMA consists of the following counties:

Pottawattamie  
Cass  
Fremont  
Harrison  
Mills  
Montgomery  
Page  
Shelby



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